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ABSTRACT

Nonresidential colleges are well-developed instructional systems that take into account system resources and constraints, system goals, human learning and communication principles, and subject matter structure. This document presents a discussion of 2 such instructional systems, the British Open University and New York's Empire State College, and in a comparative analysis discusses institutional objectives, program evaluation, planning subject matter, and planning communication systems. A discussion of possible system refinements is included as well as an appendix that lists desirable design features of an instructional system. (HS)

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Systematic Development of Instruction for Non-Residential Colleges

by

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c1972

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Those responsible for instructional design in higher education have been negligent in revising and remodeling their instructional systems. In general, institutions of higher education are negative examples of the application of principles of systematic instructional development and principles of learning and instruction. But some new institutions of higher education are beginning to emerge in Europe and the United States. Because they share the distinct feature of providing for study away from their central facilities, they have been dubbed nonresidential colleges.

If the only unique characteristic of nonresidential colleges were the opportunity to study away from the degree-granting institution, results might not be much different than typical residential colleges. What are nonresidential colleges? Are they simply an extension of a third year abroad? Are they correspondence schools? Are they field training centers? Are they something else altogether? It is my view that nonresidential colleges are well-developed instructional systems which take into account system resources and constraints, system goals, human learning and communication principles, and subject matter structure. The design of nonresidential colleges may vary, but they illustrate features of a well-developed system of instruction.

Knowing which desirable features should be built into an instructional system is a necessity for its systematic development. After a detailed analysis of two examples of nonresidential colleges, I have concluded that they have certain features in common. I do not mean to imply that all nonresidential colleges have these characteristics; that remains to be seen through further analyses. Nor do I suggest direct imitation of either example. I am suggesting that the set of common characteristics may be used to aid an instructional designer in evaluating an existing system or designing a new one.

The two examples analyzed represent different types of nonresidential colleges. One, the British Open University, is concerned primarily with academic subjects taught by correspondence; the other, Empire State College, is

concerned with meeting individual needs by creating tailor-made course programs which relate theory and practice.* Both institutions possess the defining attributes of nonresidential colleges as well as some distinct features. The information about the two nonresidential colleges was synthesized from university documents and other publications.

A Description of Two Nonresidential Colleges

The student at the British Open University learns primarily through the use of correspondence units which are sent to him once a week before associated television and radio broadcasts. In addition to written material, the units may include tapes, slides, or home experiment sets.

There are certain important factors taken into account in the planning of these units. Preparatory courses and materials outside the Open University are suggested to potential students. In each unit the student's background is considered, his knowledge, and his learning style. Most units begin with the barest essentials, as if each student had to start from scratch. Some courses have three channels: the correspondence units are the main channel; there is a lower channel for special assistance; and an upper channel for exploring the subject in depth. Almost every unit is tested and revised before being sent. Revisions are derived from criticism from the team that prepares the units, by professors from other universities, and by student guinea pigs.

Each correspondence unit begins with objectives or key questions, conceptual or structual diagrams, concept lists and outlines, or summaries to give the student an indication of the unit's content. Instructions are given throughout as to the techniques to be learned, and the philosophy underlying the lesson. For example, a student of mathematics is told that he will be

*Other nonresidential colleges can be found at University of London, New England University, Syracuse University, University of South Florida, The University Without Walls Consortium, Florida's World Campus Afloat, S.U.N.Y. at Brockport, University of Oklahoma, Friends World, and New College.

able to give examples of mappings and functions with a clear statement of the domain, codomain and rule, or a student of science might be given a list of concepts to be taught such as equilibrium, bond length, Morse Curve, and bond dissociation energy.

The correspondence courses are sequenced according to an overall view of the subject matter. For example, the basic science course progresses from simple to complex and small to large; from a study of particles, to organisms, to the environment, and to the earth.

The text is written in simple terms so that a student with a small vocabulary can proceed easily. Color highlights and asterisks are used to emphasize important points and sections.

Exercises and activities are included in each unit. There are questions about previous material or new materials; answers follow on the next page. The exercises range from rhetorical questions to practical applications: the student performs an experiment or locates some source of information. For some activities work time is suggested so that the student will not linger unnecessarily at one activity.

For each unit there are supplementary materials, including glossaries and remedial and enrichment materials, and notes about the radio and television program associated with that unit. The unit may also include references to alternative sources of information so that a student may, if he wishes, pursue his studies with other materials.

In some units an experimental kit is included; once the experiment is completed, the data is returned to be analyzed by the correspondence tutor. For example, one set of experiments conducted at the British Open University will be a national survey of pollution, and the results will be sent back to the students as well as to the government for their analysis.

One radio and television program accompanies each unit; both are broadcast once during the week and once again on the weekend. The TV program makes

the correspondence more visible, more concrete. It may show the student how what he has learned fits into the total course or how it applies to the world. It may show motion such as the growth of cells; it may show something that a student could never ordinarily see, such as the inside of a reactor or time-lapse photography; or it may show laboratory work. The TV programs are integrated with the notes; for example, following a television program about a bubble chamber experiment, the students were sent photos of the bubble chamber tracks and asked to analyze them.

Radio programs may be remedial; they may include additional explanations of ideas that students find to be difficult; difficulties are detected by inspection of student assignments. The radio broadcasts may deal with wider issues such as history and background. For example, one program included the reminiscenses of Hans Krebs on the development of the Krebs Cycle. There may be notes with pictures or equations to look at while listening to the radio program.

Every unit has self-assessment exercises, with answers that the students may consult; at the end of each unit there are also evaluations to be sent to the university's correspondence tutor. At present there are plans for the use of cassette tapes to be given to the students for recording his responses and for recording feedback from the correspondence tutor. At this time some tests are machine-scored, some are sent to the correspondence tutors, who mark them and comment on them and return them. The computer is programmed to select the names of those students whose computer-scored assignments show a work slump. This information is relayed to the student's counselor and his correspondence tutor for appropriate action. If a student has a problem, he can go to one of 250 study centers; he may see a current TV broadcast or view a program that he missed replayed on a video cassette. At

the center he may use a computer to try out his computer programs. There a student can see his personal counselor or some other counselor about certain problems he may have with his studies or about course advisement.

At the center he can also take voluntary tutorial classes where he can ask questions and receive answers. It is hoped that eventually students may be taught to help each other at the centers.

Based on the information that the students give from their assignments, an extra supplement may be issued or broadcast by the Open University staff to remedy certain student problems. The supplement may include recent information such as new research, and may correct errors or change faulty instructions.

Based on the students' opinions and their test performance, the units are changed; tutorials and counselling are altered in the same way. Invariably information about student test performance and student opinion gets back to the course writers, and they take it into account--usually not immediately, but in the long run. Some of the material that is prepared later in the course can, based on the students' opinions of previous units, be altered before it actually gets to the students. As the students' feedback is taken into account and the units are rewritten, two questions are asked: 1) Can we improve the effectiveness of the unit, and 2) Is this course really needed? To enable the Open University staff to answer these questions, money is available to redo the instructional units.

A student must fulfill certain requirements in order to graduate. Initially he chooses one of six faculties: humanities, social science, mathematics, science, technology, and education. He usually needs six to eight credits to graduate, although he may be exempted from up to three credits; these he compiles by taking two courses a year.

The student may choose any combination of courses, although some do have prerequisites, and they must take at least one basic interdisciplinary course.

The basic courses provide an introduction to the field and give students the basic concepts and principles. He receives these courses in units, at a rate of up to one unit a week for a total of as many as 34 to 36 units a year. At the year's end the student is required to attend a summer school for one or two weeks; there he has face-to-face intensive laboratory work.

New York's Empire State College

The Empire State College was developed on the hope that, as a result of experiences within that college, a student will develop competence, increase his awareness, clarify his purposes, understand himself and others, develop integrity, and become autonomous. Each of these goals is specified further in the University's documents. For example, three types of competence are promoted: professional competence, intellectual competence, and interpersonal competence. Each of these, in turn, is specified further. For example, if a person has attained a degree of intellectual competence he can "...convert new information into working knowledge...," "...analyze concrete situations and experiences as well as written materials, oral communication, mathematical symbols, and artistic representations ...," and "...synthesize materials from diverse sources to weigh evidence, to distinguish face and emotion, and to communicate effectively..."[1]

To enter Empire State College, a student is urged to visit and apply once he has decided that this is what he wishes to do. A great many questions regarding his goals and competencies are asked; this information is given to the mentor and to the people who organize the initial workshop. This information is then used to prepare for the student: the mentor can begin to locate the resources and contact the people and places that may be of help.

To reach these goals, the student at Empire State College proceeds to learn by agreeing with his mentor on a learning contract. This is an agreement

between the student and an advisor regarding what he will do, where he will do it, with whom and for how long, how many times he will communicate with his mentor, how it will be evaluated, and what the various responsibilities of the student and mentor will be.

During and after an initial workshop, which introduces the student to the university and its workings, he meets with his mentor and begins to define his objectives. His first contract is the first step toward meeting his objectives. The student must ask: What are my objectives? What do I want to achieve? What books, courses, direct experiences do I need? What kinds of persons can be helpful? What is the best sequence of activities? How much effort should be given to reading, writing, and reflection? How much should be given to field work, volunteer activities, or other kinds of direct experiences? How can I assess my progress?[2]

Early contracts are directed toward several possible future alternatives, and are not heavily centered on one small line of interest. The contracts are short at first so that a student learns how to carry out a contract and find out what he wants; it can be modified for certain reasons. The mentor checks the contract to see if the student is pursuing some new areas, if it really meets his wants and needs, if the resources to meet his needs are available, and if the student's desires lead toward the major goals of the university. The mentor helps the student locate available resources, and they select materials and courses with the help of the coordinating center at Saratoga Springs, New York, which provides the services, materials, records, and administration of financial affairs af the Empire State College. The Learning Resources Center at Saratoga Springs may develop instructional materials. The continued use and development of these materials, of course, depends on the willingness of the students to use them and to learn from them.

In a well-written contract a reader should be able to see the purposeful relationship between the experiences planned and the results desired.

Listed are particular books and alternative choices of activities; for an interview, its purpose and the person's name; for field trips or activities, when, where, with whom, and why; a schedule of meetings with the mentor for progress checks no less than one every two weeks, no more than one a month; for evaluation methods, criteria, and deadlines.

The contract is based on the student's needs and wants, and on his prior learning which has been documented and evaluated. Some of his work may be transferred from another university or college; he may have a high school diploma or equivalency exam; or documented competence in some field of endeavor. Even if he does not know how to read, write, or speak well, remedial help will be given.

A program of study includes several contracts organized around some framework such as vocational or professional goals, disciplinary or interdisciplinary viewpoints, or a problem or theme. Thus, within a contract, the student's learning activities may be chosen from a discipline area, a problem area, or an experience area. It may come from a discipline such as anthropology, economics, English, fine arts, geography, history, industrial and labor relations, mathematics, philosophy, physics, political science, psychology, sociology, or technology, from which he chooses materials or courses. It may deal with a problem or issue which is broader than the bounds of one discipline: Creativity in a Technological World, Exploring the Third World, War and Progress, The Pheomenon of Man. A student may decide to pursue some experience: private lessons, organized or independent travel, an apprenticeship, or on-the-job training for some profession. Groups of students doing on-the-job training, volunteer work, and perhaps tutorial work, and those students taking courses, may meet at the community center for cooperative work. In each type of experience the style of learning may be selected from texts, cassettes, television, correspondence courses, formal courses, independent study, self-contained study, residential workshops, kits of experiments, computer-assisted

instruction, and workshops based on common interests with other students at community centers.

The following is an example of a nine-month program of study. After an orientation workshop and some self-study on some general problems, a student may decide to take up a problem based on the general theme, The Phenomeon of Man, which will culminate in a major paper that discusses four contemporary views of man. To contribute to his paper he chooses to take a course in child development at a local college, and to work as a teaching assistant in a nursery school. The student interns at a social agency and researches such topics as social functioning, city welfare, anti-pollution, and state penal systems; and serves as a lobbyist to the city council on the problem of environmental pollution. He elects to create a slidetape presentation to show to other students with similar interests, and keeps a log showing his progress. The student also pursues a correspondence course in genetics and helps the curator of the local museum create a display on genetics.

His formal course in child development is evaluated by written exams, and his nursery school experience is assessed by the supervising teacher's oral and written reports. The research activities culminate in a research paper. The lobbying is evaluated by the student's self-analysis. The museum display itself serves as a concrete product to be evaluated, and the student takes the standard exams in the correspondence course. The slidetape presentation is judged by the student, mentor, and peers.

To secure program approval an individual submits an application which is approved by a team including faculty members appointed by the dean at the particular learning center with which the student happens to be affiliated. The program is revised until it is strong enough for the student to gain the approval of the committee. The time of program approval depends on the individual

student's performance; some may submit a program at the very beginning, and others may submit a complete program at the half-way mark.

A contract concludes with an evaluation conference; evaluation of the contract rests with the faculty. A student prepares a summary of his evaluation evidence for his mentor; the mentor reviews it. He may look at the student's log, which is a record of his activities and his opinions of his activities. There may be essays, observations, research papers or supervisor ratings. There may be grades from traditional courses and exam results. All these evaluations are kept in a file which is finally given to the student. There is another file kept as a transcript, including a series of abstracts of the achievements of each contract. If the work to date is considered to be insufficient, more work is designed and implemented. If the evidence confirms that the contract has been fulfilled, a short statement summarizing the nature of the contract is prepared for the transcript.

A student secures a degree at the Empire State College by providing evidence that he can perform diverse and complex tasks which show his competence and his awareness, or evidence of progress through a change in behavior since the time he arrived. This may be the ability to do a piece of research, to point out the application of various principles and concepts, to create a piece of fine art. The mentor and student, and perhaps an outside expert, decide at the point of completion of each contract what remains to be done to meet the student's aspirations, and the length of time that it will take. At the time of writing of the last contract, the dean, one faculty member of his choice, a faculty member of the mentor's choice, the mentor, and the student review the contract. If, through the implementation of the contract, the committee believes that the student has attained his objectives, it is approved, and the committee applies to the vice-president of academic affairs, who decides whether or not to grant the degree. If, for some reason, the committee does not approve the contract, they clarify what requirements need to be fulfilled.

An Analysis of the Instructional Systems of Two Nonresidential Colleges

When judging the design of an instructional system there are four questions that must be answered: 1) Is the system actually accomplishing what it set out to do? 2) Is the system achieving the desired results in the least costly fashion possible? 3) Do those people concerned with the workings of the system feel that the system is effective? 4) As the plan is put into effect, will additional planning and revision interfere with the effectiveness, efficiency, or acceptance of the original system? These four measures of performance, for the sake of brevity, could be called: 1) effectiveness, 2) efficiency, 3) acceptance, and 4) ease of implementation.

These four measures can be used to judge an instructional system once it has been in effect. But how does one judge a system that has not been in use long enough to answer the questions? The system's structure can be analyzed; the design of the system can be judged by its adherence to certain features. I am assuming that the presence of these features in a system leads to effectiveness, efficiency, acceptance, and ease of implementation. In the following pages I analyze the <u>design</u> of selected nonresidential colleges according to the presence and quality of plans for objectives, plans for evaluation, plans for subject matter, and plans for communication.*

Plans for Objectives

The presence of objectives in an instructional system may help the instructor and the students direct their efforts with greater accuracy. From the objectives an instructor can develop his content, his presentations, exercises, and tests. A student may be more able to study what he needs to know.

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*A checklist of these attributes is in the appendix.

If objectives are to direct both instructors and students accurately, they must be valid and well written. In order to be valid, they must include everything a person needs to know to succeed in the real world, taking into account the needs of the community. Validity implies not only what is real in terms of the system outside higher education, it implies a reality in terms of the perception of the students. The objectives must be seen by the students as relating to their goals and needs.

If objectives are going to direct students and instructors accurately, they also must communicate. This implies that they must have certain detail. They must include descriptions of the situation in which the student is required to perform, the exact nature of student performance, and the criteria by which performance will be judged. All of these components should be the best approximation of reality the instructional system will allow. The behavior of the student must be described so clearly that an independent evaluator would know what to observe. The objectives should be relatively free of jargon so that, with a minimal amount of knowledge of the subject matter, the student can understand what is required of him.

In the following analysis of the nonresidential instructional systems I considered both the total program and its major components according to each feature. The absence of a particular feature may be for either of two reasons: 1) The feature was not explained in the documents available to me, or 2) The feature was not considered in the design.

Just how does each university measure up in its planning for instructional objectives? The goals of both institutions seem valid. The British Open University considers its goal the production of students with different skills, versatility, adaptability, and capacity to learn quickly-- goals which seem realistic in light of today's changing society. The goals of the Empire State

College that were mentioned are oriented to real world problems. A student must learn how to learn in a society in which no one sets out a particular curriculum for each person.

The unit objectives in the Open University program may not be immediately related to the real world, but the foundation courses integrate subject matter with each student's common knowledge to show him where the content fits into reality. This integration occurs in the radio and television broadcasts, where background is provided and practical application is demonstrated. In the Empire State College the contract and program objectives fall within the limits of the ultimate goals which are, in turn, related to reality.

The goals and objectives of each institution appear to be related to the society's needs, but some have questioned the need for an Open University. It has been asked whether Britain's economy can absorb many new people with advanced degrees; the University's rationale is that Britain needs educated people on all social levels. As far as the Empire State College is concerned, the United States will always need adaptable people who can teach themselves readily and who can view problems with new perspectives.

Are the objectives comprehensive? For the Open University it is impossible to say: there is not enough information in the documents available to me to make a decision. In the Empire State College the completeness of the set of requirements is determined by the mentor, the student, and the committee, and is based on their awareness of what knowledge and skill are necessary for the student to achieve his goals.

The objectives may not be meaningful to the students in both settings. At the Open University it is doubtful if students can always relate the objectives to their goals, experiences, values, and interests. The objectives are set for all students; invariably, some objectives will not be meaningful to some students. This is the reason for the foundation course, in which

students learn what the objectives mean to them. In contrast, at the Empire State College the contract and the program are, by definition, meaningful to the student. They contain experiences that meet his particular needs.

The objectives for the Open University and Empire State College are fairly well written. The system goals for the Open University are vague, but provide sufficient information to serve as guides. The unit objectives are stated in terms of student behavior: some include conditions for performance; most imply a criterion that is in accordance with the content of the unit. The language of the unit objectives is relatively jargon-free and is based on the student's prerequisites from other units. The Empire State College's goals are well stated and detailed; some include behaviors, conditions, and even criteria. In addition, the Empire State College has rules which call for specific objectives in the contract. The rules call for specific demonstrations of competence and for specific statements of criteria.

Plans for Evaluation

Evaluation includes judgment of student achievement and system quality. To judge a student's progress, an instructional system must provide for continual evaluation. There must be provision made for assessing the student's entry performance and the student's status during the course of instruction, with special emphasis on diagnosis and remediation of errors in performance.

In most instructional systems it is the custom for teachers to evaluate student progress, but if a designer is to make the best use of his resources, he might include student help. Self-testing by students is an efficient method; students cannot only test themselves but diagnose and remedy their own errors.

To make an accurate judgment of student progress, tests must have four properties: validity, objectivity, stability, and comprehensiveness. Validity

implies that the test is measuring the desired performance in the objective; it also implies that the student is judged according to the objective and not in comparison to his classmates. Objectivity implies that the evaluation criteria are so carefully delineated that using them, judges will come up with approximately the same judgment. Stability requires that the testing program discover whether a student has the ability to maintain performance from that point on. Comprehensiveness means all objectives are tested.

Failure of a student to achieve may be due to faults within the system; therefore, the system itself should be evaluated continually. In an assessment of an instructional system, changes should be made as soon after the diagnosis as possible.

The design features mentioned so far require a lot of testing. To reduce the amount of evaluation that must be done, many tested materials must be employed in the system.

The Open University and the Empire State College evaluate continuously; they assess a student's prerequisite abilities and his progress. It appears that prerequisites are not as carefully assessed at the Open University as they might be; a lack of prerequisites is generally assumed. The correspondence texts start from scratch and programmed texts are used to build prerequisites.

The evaluation of a student's progress at the Open University is particularly noteworthy. To find errors in student achievement, weekly correspondence materials are checked and machine-scored. Through self-tests and tutorials at study centers, a student can receive a speedy diagnosis and prescription. The likelihood of accurate diagnosis is increased when reduced rates of achievement are detected in student assignments by the computer or correspondence tutor. The correspondence tutor may comment or may arrange for a written or broadcast supplement.

While a student waits for diagnosis and remediation, the instruction proceeds; he may be left behind. If the student takes advantage of the tutorial courses at a study center where there is an opportunity for immediate diagnosis and remediation, the problem may not be as pronounced. To reduce the problem further, British Open University intends to develop systems of peer teaching.

The Empire State College does well in its continuous evaluation. To provide for an assessment of prerequisites, students answer a number of questions about themselves and document or demonstrate their abilities. Frequent meetings with an advisor to check progress constitutes formative evaluation. The evaluation conference is an opportunity to diagnose and remedy; at this time the conference members ask themselves if the student achieved what he set out to do. If he did not, he is given another opportunity to reach his criteria.

In both systems the tests are generally well constructed. The yearly final exams in the Open University consist of essay or multiple choice questions; for lack of information, it is impossible to determine their validity. The documents do reveal that the examination writers are aware that tests should relate directly to the objectives and exercises. It is difficult to believe that a three-hour final exam can measure a year's work, although the evaluation program is continuous, and when one considers that there are two tests per unit of instruction, the testing program seems likely to be comprehensive. The final exam may be an effort to measure the stability of the student's learning, but the documents don't specify a precise plan to require retesting a student's knowledge of past units. The weekly unit exams are valid; the tests fit the objectives. The objectivity of the machine-scored tests is fairly certain, but the correspondence tutor's response would depend upon the specificity of the criteria.

The final evaluation of a program at the Empire State College is likely to be valid if the program objectives are based on reality and if the evaluation committee requires a demonstration that fits the objectives. Each contract is supposed to contain precise objectives. As stated before, the validity of the contract evaluation depends on the specificity of the objective and the approximation of the measure to the objective. The decisions regarding validity, objectivity, comprehensiveness, and an estimate of stability rest with the mentor and student.

Self-evaluation is built into every unit of instruction at the Open University. At the Empire State College the number of self-evaluation opportunities depends on the experience selected. For some experiences, such as independent study, the student may be required to derive the criteria to evaluate his own performance.

The Open University provides for continual evaluation of its instructional system. Every student achievement and opinion is recorded. When the information is processed, and a unit is found to be faulty, instructional supplements may be given to the students. Immediate changes are not made in the unit. Some units which come later in the year and are not already in print may be modified. There is approximately one year lag time for full unit revisions.

Change in the system operation in the Empire State College depends on the decisions of the mentor and student. The mentor may make changes based on the student's ability to carry out his first contracts. Thus, at an evaluation conference, the mentor and student should consider other ways of functioning that take into account student achievements and opinions.

The two institutions save themselves a considerable number of problems by using tested materials. In the Open University almost all units are tested on students and checked by outside experts; broadcasts are not. At Empire State College a mentor may choose tested materials or ask to have some created.

Plans for Subject Matter

The subject matter of the instructional system should have three features: it must be relevant, it must be factual, it must have order. Information in units of instruction should be relevant; if a student knows the ideas, he should be more able to attain the objectives. The content should be factual; colleagues should agree as to the substance of the units. The subject matter should appear in some ordered sequence based on its intrinsic structure. It may be a hierarchical sequence such as those suggested by Gagné or Piaget, or it may be a logical sequence or one empirically derived.

In each unit at the Open University there are lists of concepts and principles, and structural diagrams, illustrating relationships between ideas, which are derived by task analysis and content analysis to help students meet the objective. The course planners attempt to eliminate irrelevant content. Whether or not their derivation is valid must be determined empirically. The radio and television broadcasts may seem irrelevant in relation to the objectives; they relate to motivational objectives, which are not directly stated to the students.

The rules for forming a contract at the Empire State College require that the tasks and knowledge acquired help meet the contract objectives. The rules must be carefully enforced because tasks and ideas learned from direct experience may not meet a set of objectives: a potentially useful experience directed at learning the process of law enforcement in the attorney general's office might turn into a series of tasks like stuffing and licking envelopes. The mentor and student may have to analyze the content of available experiences and arrange for tasks appropriate for the desired objective.

The content of the Open University's units is verified by colleagues outside the university. In a program of instruction at the Empire State College,

there is some possibility for deviation from fact; the content and tasks in a traditional course, a private lesson, or even some direct experiences may include erroneous concepts, principles or skills.

The content of the Open University is well sequenced. Each sequence's development is based on the intrinsinc structure of the subject matter. The problem in deriving such structure arises from the complex nature of certain fields of knowledge, and a dearth of techniques to sequence the content. At Empire State College the mentor and student sequence the instruction.

Plans for Instructional Program

There are many aspects to consider in program-planning. In a program a designer should have plans accounting for motivational systems, practice schedules, integrated courses and materials, and the results of evaluations.

One essential feature of an instructional program should be that it makes provision for the student's prerequisites. There should be a remedial program, some advanced courses, and some courses for those who are of average ability. The greater the individualization the better.

A good many facets of the program relate directly to the objectives. For example, different instructional techniques should be suited to different types of objectives; concepts should be taught differently than psycho-motor skills; attitudes should be taught differently than principles. Media should fit the requirements of the situation described in the objective: if a situation in the objective requires response to visual cues, then the program should include presentations that are visual. In addition, the objectives should present tasks that are a challenge to the student, that require the student to take successively more difficult steps in a sequence of tasks beyond his present achievement.

There should be a variety of approaches within the program to achieve

a given objective; if there are enough varied approaches, a student may be given the opportunity to choose from the approaches. In addition, the student should be able to choose among the objectives and the means for reaching the objectives, such as the pacing, the style of learning, and so on.

The exercises should relate as closely as possible to the objective. The student should get direct practice in performing what is required of him. If necessary, the practice should be active; that is, he should make overt responses. It should be frequent, so that he does not forget what he has learned. It should be comprehensive; that is, exercises should be performed for each objective. Practice sessions should be short and spaced over time. In order that the student reach a high standard, exercises should be of increasing difficulty.

There should be motivational elements in any program; these may include the rewards given to students. Rewards should be those things that are valued by the students. When possible they should be natural results like a successful job or a successful product, not artificial rewards such as grades. A pleasant environment, one which has few physical and psychological aversive stimuli, should be present for physical and emotional support. In addition, there should be concerned people in the instructional system who show the student that someone cares about his success.

In every complex instructional system there are so many components that some integrating and coordinating functions must be provided for. The theoretical and applied components of any instructional system must be integrated in some way, and the various media used within the system must be coordinated.

Generally, for the total program it is best if a cost/effective procedure can be determined; that is, the best use is made of the resources available, and the best procedures are used for the least amount of money.

Both universities take into account prerequisites in their pro ram. In the Open University it is standard procedure to suggest outside preparation and to send programs of instruction to teach students prerequisites. Each instructional unit, at least those in the beginning, start from scratch, and different paths are provided for students. They do not, however, account for variations in speed of learning, unless the student is clever enough to catch up on the texts and view the video cassettes at the study center.

The Empire State College excels at considering student prerequisites. Every contract is based on the individual's ability and proceeds according to the educational cliche, "start where the learner is." It is completely self-paced, and provides an orientation for the student on how to learn from the system, and attempts to teach for such prerequisites as reading, writing, and mathematics.

Both universities seem to be able to relate their programs to their objectives. The Open University apparently uses different yet appropriate media and techniques in an effort to help students reach different types of objectives: the radio is used for motivational objectives; kits are used to teach actual laboratory skills; TV is used to take the student places he can't go; the texts are used to teach verbal and symbolic information. At Empire State the instructional media and techniques are chosen by the student and mentor. Both universities excel in providing a variety of presentations and activities for their students.

The two institutions are designed to challenge their students. At the Open University, the units are arranged so as to be progressively more difficult. The relative difficulty must be checked periodically by studying student achievement and opinion. At Empire State the mentor sees to it that the student learns new things, explores new ideas, and is continually challenged.

At the Open University students may choose between courses but not among objectives. They may choose among various paths of study and among alternative texts; they must decide whether or not to take advantage of tutorials at the study center. The Empire State College excels in providing student options: the student has a say in most decisions regarding his learning.

Figure 1, following, summarizes each institution's program of student practice. Figure 1 suggests that field experience presents the problem of quality control.

Figure 1

A Comparison of the British Open University & the Empire State College in Their Student Exercises

Exercise Feature	Presence in Open University	Presence in Empire State
Active	Yes: Exercises & Self-Tests, Assignments Experiments & Other Activities	Perhaps; depends on experiences not in traditional lecture courses
Frequent	Yes	Perhaps; depends on the options stated in the contract
Related to Objective	Yes	Yes; as related to general goals of autonomy, etc., but cannot be guaranteed for field experience
Comprehensive	Yes	Perhaps; doubtful in field experience
Spaced	Yes	Perhaps; depends on contract
Short	Yes; some exercises are timed	Perhaps; depends on contract
Of Increasing Difficulty	Yes	Perhaps; some not controllable, such as field experience

In both systems there are ways to maintain motivation. The Open University provides rewards through feedback, through successfully completed activities, through praise from the correspondence or the live tutor, and through praise from the counselor. At Empire State College, rewards may come in the form of job satisfaction, a product, the mentor's praise, the student's new ability to take the next step and put together a new contract, or a peer's praise.

At the Open University responsibility for creating a pleasant study environment rests with the student. The tutors should attempt to make the study center a pleasant place to be. In the documents I have seen there is no information as to whether that is built into the system; the pleasantness of the learning environment at the Empire State College depends on the mentor. The Open University provides concerned people: the correspondence tutor, the counselor, and the live tutor to motivate the student. The Empire State College provides the mentor, the members of the planning committee, and the supervisors and teachers that are chosen.

At the Open University the theory and application in all subjects are integrated through home activities, summer school, televised lab experiments, and practice treatments. The media are well integrated by the course planning team. At the Empire State College the mentor attempts to integrate the theoretical and the practical in contract and program formation. The integration of media depends on the choice of mentor and student.

Both instructional systems use their resources well; they make the best use of available facilities and materials, and require only a few new ones. In addition, it is believed that if 20% of those students enrolled in the first year of the Open University graduate, the university will have invested only 1/2 of the cost per graduate of the conventional university. For example, the Empire State College requires no campus; it may use the existing facilities of the whole State University of New York.

Plans for Communication System

In any instructional system there are many messages to be communicated; to insure that these messages are received, an appropriate communication system must be established. The messages to be delivered are notes and aids explaining to the student the structure and organization of the subject, information and examples which accentuate the properties of the idea and relate to what the student already knows, labeled models of the kind of behavior that the student is to imitate, the desired results of the course, the criteria for evaluation, the nature of the test, any changes that may occur within the system as a function of the system evaluation, and any schedule of activities.

The system must insure that the information listed above is accurately understood. To do this, one must be sure that the visual and the audio media are indeed visible and audible. There must be two-way communication, a complete cycle between student and student, and student and instructor. Questions must be encouraged, asked for, and answered. There must be some system by which a message is somehow verified, and full feedback to students which tells them what they have done well, what they have not done well, and what they should do next. Records should be kept of all communications, especially those that deal with evaluation. Any necessary prompting or guidance should be readily available.

The Open University and Empire State do their best to communicate the information necessary for each student to learn. The information consists of many different types of messages.

The following chart (Figure 2) checks the presence of various messages in each university. Apparently both universities have all the necessary messages.

Figure 2

The Presence of Messages in Information Systems
of the Open University & the Empire State College

Communication Messages to be Transmitted	Present in Open University	Present in Empire State College
Aids & notes to reveal subject matter structure	Yes; e.g., structural diagrams	Maybe-- depends on experience; most likely made by student or found among mentor's suggested resources
Information, definitions, descriptions & examples possessing accentuated properties & related to common experiences	Yes, all information present, examples, properites accentuated with prompts relating to common experiences	Maybe-- depends on selection of mode; Not likely in formal courses or some correspondence courses; likely in tutorial or field experience
Labeled models	Yes, in texts, TV, & lab demonstrations	Maybe-- models available in field experience, but may not be clearly labeled
Intent of instruction: desired results	Yes, in numerous ways including objectives	Yes, within contract & program plan
Changes in system	Yes, in supplements or on radio	Yes, through mentor conference
Criteria for evaluation	Yes, through self & unit tests	Yes, through mentor conferences & from contract
Nature of test	Yes, through self & unit tests	Yes, through mentor conferences & from contract
Schedule	Yes, in the prospectus	Yes, through mentor conference & from contract

Both universities do their best to make the communication cycle complete. The Open University provides good visual and audio materials. The staff members try to increase the probability of two-way communication; the correspondence tutor may be a little slow, the tutorial professor and the counselor may be faster. It is uncertain as to whether or not there is a system to check if a message is received, whether or not a suggestion or a correction from the correspondence tutor is understood. There may be full feedback from the correspondence tutor

to the student. There is no indication as to how the computer program scores are fed back. Records, of course, are extensive and are well kept. Necessary prompts and guidance are given to the student throughout the units: in the materials, the student finds asterisks and colors to point out what he needs to know, and a counselor is available for extra motivational boosts.

The Empire State College, too, does its best to insure communication, although we don't know if the visual and the audio materials are good. The choice of materials depends, of course, on the criteria used by the mentors and the students. Two-way communication of ideas is very likely between mentor and student, but is not necessarily present in different experiences. There is no indication of any sort of message verification system. Students probably will receive full feedback from the mentor, but not necessarily from other sources such as the traditional courses or field experiences; nevertheless, students can learn to demand full feedback. Students can also get realistic feedback from field experience, but they must learn to look for cues and learn to interpret. Records are kept of the student's evaluations and contracts. He is likely to be provided prompts and guidance by the mentor depending on his prerequisites and his work on his first contract. It would probably be best if the mentor were to provide a considerable amount of prompting and later withdraw his advice and counseling, letting the student do more as he becomes more aware and more competent.

A Discussion of Possible System Refinements

From the analysis it appears that the features of a course of instruction at the Open University are set and are well planned, but provide limited options for students and may not be modified quickly. In contrast, at the Empire State College a pattern of learning is arranged, but many of the specific design features are left to the decisions of mentor and student. The opportunity for mentor and student to determine a course of study is likely to

generate high motivation and the ability to do self-teaching; the system is also likely to lend itself to modification within a brief time span. The great number of choices to be made, and the mentor and student's likely diversity of knowledge and skill in subject matter and instructional design, make it probable that choices will be made which will not lead to effectiveness, efficiency and acceptance. The comments below reflect this conclusion. The suggestions for the Open University are directed toward increasing options and speeding up system modification. The recommendations for Empire State point out possible adjustments to avoid likely errors.

The planning of objectives of each nonresidential college manifests strengths and weaknesses. In the Open University the course planners probably know the referent system and the real world-- they presume their objectives fit the real world, and that their set of objectives is complete. Such plans may be inflexible and may not meet the needs of all potential students. An extension of the three-channel system, and the choices between courses, would alleviate this problem. As courses are written and tested, more options are likely to evolve. In addition, once products are developed, more options for self-pacing may be given.

While flexible and individualized, the planning procedure for objectives at Empire State College also has a deficiency: the student may not know the referent system and may not be able to write objectives which fit the real world or are even complete. Thus, it may be beneficial at first to provide maximum guidance by someone who does know the real system and can complete realistic requirements. This help should be phased out as the student begins to learn what is necessary to learn to achieve his purposes.

The Open University might explore the possibility of reducing the time required to modify units of instruction by going one step beyond the present

system in this way: discover the revision time needed for one unit of instruction, taking into consideration other planning duties. Randomly select one small subpopulation and, according to the time found necessary for revision, begin the course of instruction that much earlier than the others. Give these students the complete unit, including broadcasts; collect the data, and produce the revised supplements for them while integrating revisions into the units in time for use by the major population.

Prerequisite assessment may be refined through two approaches. First, an analysis may be made of the factors that lead to success in a nonresidential college; self-motivation, the ability to direct one's own learning, the willpower needed to set aside time for study, might be factors to consider. These may be used as selection criteria or as course objectives for an orientation period.

A second approach would be to formalize what takes place in the system. At present, prerequisites are assessed most completely by observing a student's progress early in his college studies. At the beginning of the student's first year, a certain amount of time should be set aside that will serve as a trial study period. During this trial period, data should be collected for the purpose of assessing prerequisites and remediating faults. The type of objectives and experiences for study should be chosen specifically to assess the student's ability to learn different subjects in different ways.

The mentor at the Empire State College has a difficult job: he must help determine objectives, program and evaluation. He may have considerable control over the student's decisions, and, in carrying out this job, his most critical task is to adjust his control to the individual student. To find out how this might be done with greater exactness, further specification of the mentor's performance may be necessary. Several questions should be answered: When should a mentor be directive, and when should he be nondirective?

How should he balance fostering the goals of the institution and allowing the student to carry out his own choices? How long should he let a student explore a particular area before intervening?

It is likely that the Open University and the Empire State College will produce both conventional and unconventional results. Conventional results such as academic achievement are relatively easy to assess, but careful thought should be given to measuring such unconventional outcomes as adaptability, the ability to pursue lifelong learning, and moral integrity.

A major component of many nonresidential colleges like Empire State is the choice of direct field experience, which provides meaningful, real practice. While some educators believe in providing experience for its own sake, I contend that a certain amount of direction and precise evaluation is necessary to maximize learning.

Field experience may lack this direction and evaluation. A field supervisor may not allow a student to practice what he wanted to learn to do. When evaluating, the supervisor may not be able to see what the student sees and does. When reviewing the experience, the supervisor and student may not have a common referent. The evaluator may not be sure what the student actually experienced. There may not be a field supervisor, or the supervisor may not have time to spend with the student to guide and evaluate him in a comprehensive way. The supervisor may not have the ability to model for the student the behavior the student needs to learn, or he may not be able to point out vital steps and decisions in the performance. In addition, the experience may not be complete; crucial situations may not arise. The student's work might not always be safe: consider the danger of having a novice deal with a client in a hospital or a social work agency.

Just as a mentor and student at Empire State contract for a course of study, so might an advisor or student contract with a field placement center.

A supervisor should be chosen who has time to spend with the student, who can model appropriate behaviors and communicate what he is doing and why he is doing it. Simulation should be used to provide rarely occurring or possibly unsafe experiences.

To increase the likelihood that the evaluation of a field experience will be valid, objective, and comprehensive, the student should be taught 1) how to make a checklist of criteria, 2) how to recognize both examples of violation of criteria, and examples in accord with criteria, and 3) how to work in teams to do peer assessment. An additional possibility might be to ask a student to provide empirical evidence that he has fulfilled the criteria: an objective observer's report, a video or audio recording, a tangible result such as a computer printout, a work of art, or a student that he has tutored.

Sequencing experiences, such as theory and practice, or types of knowledge, such as principles and techniques, is a major consideration in nonresidential colleges like Empire State College. I would suggest having a short experience first, so that the student has a referent to relate the second component, the study of theory. This could be followed by an extended experience to put theory into practice. In the sequencing of techniques and principles, I would advise beginning with instruction on techniques, following with instruction on principles, and concluding by teaching how to derive techniques from principles. A nonresidential college such as Empire State College might follow this general sequence: 1) have the student discover by means of direct experience what he wants to learn, 2) help him learn what criteria he wishes to reach, 3) in a theoretical course, teach him to distinguish the characteristics of those criteria, 4) teach him to evaluate himself or do peer evaluation in a practical experience, and 5) help him to meet the criteria by means of direct experience.

Practical or theoretical experiences may conflict with each other, and there should be specific provision made for an experience linking theoretical and applied knowledge rather than presenting two separate experiences.

While one may learn how to learn through experience, a nonresidential college student might also benefit from learning concepts and principles of educational technology. These ideas would prove useful to the student for teaching himself in a systematic fashion.

Conclusion

Two reasons for designing a nonresidential college program are need and desire. Such a program is often created to meet a particular need -- the resources of an institution and the nature of its potential students force the choice. The institution may not have sufficient equipment, space, staff, or money to meet the needs of large numbers of students with diverse backgrounds and goals. The nature of the student's work may interfere with the typical residential program: he may not be able to come to college because he must work to support a family or because he lives in a remote area.

Instructional reasons may motivate the planners of a nonresidential program. For example, in such a program, a student can acquire skills that he will need in the real world; his practice in real situations may relate theoretical knowledge to an applied situation. In addition, a student is likely to be motivated by the strong connections made between his needs, his theoretical knowledge, and his ability to apply what he knows.

In evaluating and designing an instructional system the ultimate criteria should be kept in mind. No matter how many characteristics are included in a college, the questions of effectiveness, efficiency, acceptance, and ease of implementation are still critical. One must still ask: Does the system work? Does it work in a way that justifies its cost? Do people within the system

believe the program is effective? Do people outside the program feel it is effective? Do others imitate it? Have the plans been easy to put into effect? Have the plans unfolded as they should have?

To be effective, a nonresidential instructional system might include features like those described in this paper. To develop and design such a college, one needs to apply system development skills: deriving and writing objectives, task description, task analysis, and system description. In addition, a designer must be able to convert models of human learning, instruction, and communication into practial programs.

Any new endeavor has pitfalls; the designs may not be easy to implement. Nonresidential colleges will not solve all the problems that plague higher education, but their creation does represent a daring attempt to achieve that ideal. A nonresidential system is not composed of new ideas; it does include serious application of instructional principles, judicious use of resources, and consideration for the individual learner. To the extent that nonresidential colleges possess the attributes of systematic instruction, they will be effective in teaching conventional and unusual objectives to more and varied types of students, more quickly and for less money, making the people involved feel that nonresidential study is exciting and gratifying.

Nonresidential colleges are likely to change the outlook of higher education much as Sesame Street has changed the view of early childhood education. It may take a radical approach such as this to achieve the educational ideal expressed by the motto of the State University of New York: Let each become all he is capable of being.

Yelon - Draft #3
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APPENDIX

Desirable Design Features of an Instructional System

This list of features represents a point of departure, not a final statement of the design characteristics of an effective instructional system. The list is based on the view that learning principles can be converted to instructional procedures and that the instructional procedures will lead to learning. It is not complete nor fully detailed. Not all features need be represented in a system. Each item is explained in: "Systematic Development of Instruction for Nonresidential Colleges" by Stephen L. Yelon.

A. Is there a plan for deriving and writing the OBJECTIVES of the instructional system? Are the objectives:

1. related to reality: are the objectives derived from real-world requirements and needs?
2. comprehensive: are they a complete set of requirements?
3. meaningful to the student: are they related to student's needs, experiences, goals?
4. detailed, including conditions, behavior, and criteria?
5. clearly stated: do they describe observable student behavior and are they relatively jargon-free?

B. Is there a plan for EVALUATING the system? Does it include:

1. a method for assessing a student's knowledge and skill when he enters the instructional system?
2. frequent formative evaluation: is there a way to test a student's progress during the course of instruction?

3. diagnosing and remedying problems discovered in student performance?
4. valid achievement assessment: do the final exams measure the objectives as they are stated? Is each student's competence judged in relation to the objectives rather than in relation to his peers' performance?
5. objective achievement assessment: are the students' performances judged by objective criteria?
6. comprehensive assessment: are all the objectives assessed?
7. a measure of the stability or retention of the student's performance?
8. student self-testing and student self-evaluation?
9. continual evaluation of the instructional system during and following implementation?
10. diagnosing and remedying problems discovered in the instructional system, such as errors in the instructional sequence?
11. tested instructional materials?

C. Is there a plan for deriving the SUBJECT MATTER of the instructional system? Does the subject matter include:
   1. enough tasks and information that contribute to performance required to meet the objectives?
   2. factual information: agreed upon by colleagues?
   3. a sequence based on the structure implicit in the subject matter?

D. Is there a plan for establishing an instructional PROGRAM which includes:
   1. a system which takes into account the presence or absence of student prerequisites?
   2. different teaching techniques for different objectives?
   3. use of media which present the signals to set the occasion for the performance requirements of the objective?

4. challenging tasks: tasks that are neither too hard nor too easy? Does it require the student to take successively more difficult steps in a sequence of tasks beyond his present achievements?
5. use of varied approaches for student exercises and media presentations for a given objective?
6. student choices regarding objectives and instructional techniques?
7. student exercises which are active, frequent, geared to the objective, comprehensive, spaced, short, and of increasing difficulty?
8. concerned human beings interested in the student's success in learning?
9. an environment that is perceived to be pleasant by the student?
10. rewards for work well done that account for individual student's preferences and the task's natural consequences?
11. a system for integrating theoretical and applied courses?
12. a system for coordinating all related media?
13. a cost effective method considering the system's resources?

E. Is there a COMMUNICATION system which provides:

1. aids and notes which direct the student to organize and structure the subject matter?
2. specific examples that accentuate the properties of a concept and relate to student experiences, values, and goals?
3. labeled models to illustrate objects or demonstrate processes to be learned?
4. some means of communicating instructional intent to the student?
5. information on procedures, instruments and criteria for evaluating student achievement?

6. a plan to inform everyone concerned about changes made on the basis of instructional system evaluation?
7. a schedule of activities?
8. a system for record keeping and retrieval?
9. visible and audible media?
10. a setting where the student's ideas and questions are encouraged, accepted, and answered by instructors and peers?
11. a system to verify communication between instructor and student?
12. full feedback following evaluation: what was done right; what was done wrong; what is to be done?
13. temporary prompting of the student's performance when necessary?

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